

PATIENT DATA COLLECTION SYSTEM

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PATIENT DATA COLLECTION SYSTEM

Field of the Invention

6 This invention relates to instruments for detecting
7 and measuring biological functions and for collecting
8 patient screening data.

Background of the Invention

12 It is common practice before a patient undergoes a
13 medical exam or receives medical treatment to collect
14 information about the patient's medical history and present
15 physical condition, which information typically includes
16 the patient's sex, age, height, weight, heart rate, blood
17 pressure and any prior physical injuries, conditions and
18 allergies to medications. In the course of such a patient
19 screening process, many physicians also ascertain the
20 quality of the patient's hearing, vision and balance,
21 especially with older patients. Many employers also
22 require similar screenings of employees as a condition for
23 employment and often for continued employment.

1 Presently, patient height is measured manually with a
2 measuring device or height gauge, weight with a scale,
3 heart rate with a heart rate monitor or manually, and blood
4 pressure with a sphygmomanometer. Hearing is usually
5 measured with tone delivering instruments or by whispering
6 words for the purpose of ascertaining whether the patient
7 can hear and understand the whispered words or by means of
8 a comprehensive hearing exam, and balance by means of a
9 force platform, which is an instrument that receives an
10 individual in a standing position and measures the forces
11 exerted by the individual that relate to his or her
12 standing sway. Other subjective tests can also be used for
13 measuring the competence of a patient's balance. Vision
14 quality is usually ascertained by means of a conventional
15 vision exam, which entails the patient reading various
16 lines of a standard Snellen eye chart or the like.

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18 Physicians are typically very busy and their offices
19 understaffed. Because it takes a considerable amount of
20 staff time to ascertain patients' medical histories and
21 states of physical condition, this patient screening is
22 usually done carelessly, incompletely or not at all.
23 Furthermore, few physicians have force platforms in their
24 offices because they are expensive and do not generate

1 adequate reimbursement fees. As a result, most physicians
2 who ascertain balance competency in patients in screening
3 procedures do so with subjective and poorly accurate
4 evaluations based on the subject's capability of walking,
5 standing from a chair and other daily activities.

6

7 Given these and other deficiencies in the art, there
8 is a need for a multi-tasking screening device that
9 incorporates a configuration of instruments for detecting
10 and measuring a host of biological functions in humans in a
11 single screening tasking process including height, weight,
12 balance, and hearing and vision acuity, and that
13 incorporates a user interface for permitting the input of
14 specific patient information including patient's age, sex
15 and details surrounding patient medical history.

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1 Summary of the Invention

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3 The above problems and others are at least partially
4 solved and the above purposes and others realized in a
5 system that includes force measuring apparatus for
6 measuring weight and balance forces, an abutment attached
7 at a location spaced from and in opposition to the device,
8 apparatus for delivering screening stimulus proximate to
9 the abutment and for calculating height measurements
10 between the abutment and the device, input apparatus for
11 accepting patient responses to the screening stimulus, and
12 a processing unit associated with the force measuring
13 apparatus, the apparatus and the input apparatus for
14 collecting and storing measured weight and balance forces,
15 patient responses from the input apparatus and calculated
16 height measurements between the abutment and the force
17 measuring apparatus. The system is preferably self-
18 contained and well constructed and relatively small and
19 easy to move, and the force measuring apparatus is pivoted
20 to a base of the system so that it can be moved between
21 deployed and stored conditions. The system is furnished
22 with a carriage reciprocated to a support projecting away
23 from the base, which supports the abutment and associates
24 with the apparatus. The screening stimulus includes visual

1 acuity stimulus, and the apparatus includes a display and
2 the visual acuity stimulus displayed by the display. The
3 apparatus also includes a sensor calibrated with a scale
4 supported along substantially the entire length of the
5 support and that communicates with the processing unit and
6 that, with its association with the scale, calculates the
7 distance between the abutment and force measuring apparatus
8 at any position of the carriage along the support. The
9 screening stimulus also includes audible acuity stimulus
10 and the apparatus speakers or headphones and the audible
11 acuity stimulus is issued by the speakers or headphones.
12 The input apparatus includes a microphone for accepting
13 verbal patient responses to the issued stimulus or a keypad
14 for accepting input patient responses to the issued
15 stimulus and preferably both. The keypad accepts the input
16 of specific patient information including patient's age,
17 sex and details surrounding patient medical history and the
18 input of this information can be delivered verbally and
19 collected by the microphone.

1 BRIEF DESCRIPTION OF THE DRAWINGS

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3 Referring to the drawings:

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5 FIG. 1 is a perspective view of a system for
6 collecting patient data, in accordance with the invention,
7 including force measuring apparatus attached to a base, a
8 carriage attached to a support projecting away from the
9 base and having stimulus delivery apparatus and input
10 apparatus for accepting patient responses to screening
11 stimulus delivered by the stimulus delivery apparatus;

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13 FIG. 2 is a side elevation of the system of FIG. 1 as
14 it would appear in use;

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16 FIG. 3 is a rear elevation of the system of FIG. 1;

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18 FIG. 4 is a fragmented perspective view of the system
19 of FIG. 1 showing a cover of the base as it would appear
20 detached therefrom;

21

22 FIG. 5 is a fragmented perspective view of the system
23 of FIG. 1 showing the carriage; and

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1 FIG. 6 is a schematic representation of the system of
2 FIG. 1.

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1 DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

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3 Turning now to the drawings, in which like reference
4 characters indicate corresponding elements throughout the
5 several views, attention is first directed to Fig. 1 in
6 which is seen a system for collecting patient data,
7 embodying the principle of the instant invention, generally
8 indicated by the reference character 20 including force
9 measuring apparatus 21 attached to a base 22 each being
10 positionable against the ground or other supporting
11 surface. With additional reference to FIGS. 2 and 3, an
12 elongate support 23 is attached to and projects upwardly
13 and away from base 22 and supports a carriage 24 away from
14 apparatus 21. Carriage 24 is attached to a support 23 for
15 reciprocal movement. In this embodiment, carriage 24
16 defines a socket 26 (shown only in FIG. 1) through which
17 support 23 extends. Socket 26 captures support 23 and
18 supports bearings, casters, sheaves or wheels that mate
19 with and ride in grooves or channels formed along
20 substantially the entire length of support 23, which
21 structure permits carriage 24 to move smoothly and
22 reciprocally along support 23 and can be reversed.
23 Carriage 24 can be reciprocally attached to support 23 in
24 other ways, which will readily occur to the skilled

1 artisan.

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3 Looking momentarily to FIG. 6, which is a schematic
4 representation of the various components of system 20,
5 force measuring apparatus 21 measures weight and balance
6 forces and thus includes a scale 30 component and a balance
7 force measuring device 31 component. Carriage 24 supports
8 input apparatus 33 and stimulus delivery apparatus 34, all
9 of which are electronic components that communicate
10 electronically with a central processing unit 35.
11 Processing unit 35 governs the operation of system 20
12 consistent with a preprogrammed software architecture 36,
13 and is associated with electronic storage 37 for receiving
14 and storing data and information from force measuring
15 apparatus 21, stimulus delivery apparatus 34 and input
16 apparatus 33 and this will be discussed in more detail
17 *infra*. Force measuring apparatus 21, input apparatus 33,
18 stimulus delivery apparatus 34 and processing unit 35 are
19 coupled together with conventional data transfer and
20 electronic interconnections and wireless communication
21 pathways can be used if desired. Preferably, processing
22 unit 35 is housed within base 22 as shown in FIG. 4. Base
23 22 includes a housing that incorporates a removable cover
24 40 for facilitating access to processing unit 35 for

1 maintenance, upgrading, etc. Processing unit 35 can be
2 housed elsewhere. System 20 is self-contained and powered
3 by a dedicated power source or a discrete power source,
4 such as one or more rechargeable batteries.

5

6 Looking back to FIG. 1, force measuring apparatus 21
7 includes a housing 50 that supports and contains the scale
8 30 and balance force measuring device 31 components (scale
9 30 and device 31 components are referenced only in FIG. 6),
10 and defines a load bearing surface 51 for accommodating a
11 patient in a standing position as depicted in FIG. 2. The
12 scale 30 and balance force measuring device 31 components
13 of force measuring apparatus 21 are capable of measuring,
14 respectively, the weight of and balance forces applied by a
15 patient standing upon load bearing surface 51. In this
16 regard, the scale 30 and balance force measuring device 31
17 components of apparatus 21 interact with load bearing
18 surface 51 and are conventional and conventionally arranged
19 in connection with one another and with load bearing
20 surface 51. The scale 30 component is any conventional
21 electronic scale arrangement for measuring weight and the
22 balance force measuring device 31 component is any
23 conventional force platform arrangement for measuring force
24 components and moments along one or more axes and along one

1 or more associated orthogonal axes for use in measuring
2 such forces exerted by a patient in varying forms of
3 stance.

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5 With continuing reference to FIG. 1 and further
6 reference to FIG. 5, carriage 24 supports an abutment 60,
7 speakers 61,62, a display 63 and input apparatus 33.
8 Speakers 61,62 can be designed as headphones if desired.
9 Speakers 61,62 and display 63 make up stimulus delivery
10 apparatus 34, the operation of which is governed by
11 processing unit 35. Processing unit 35 can be considered
12 part of stimulus delivery apparatus 34. Abutment 60 and
13 speakers 61,62 extend away from support 23, overlie force
14 measuring apparatus 21 and are situated in a triangular
15 pattern adjacent display 63, which is located toward
16 support 23, with abutment 60 located above and between
17 speakers 61,62. As shown in FIG. 1 and 2, abutment 60 is
18 supported above and in direct opposition to load bearing
19 surface 51 and is associated with a sensor 65 that is
20 calibrated with a scale 65A supported along substantially
21 the entire length of support 23 and that communicates with
22 processing unit 35 and that, with its association with
23 scale 65A, calculates the distance between abutment 60 and
24 load bearing surface 51 at any position of carriage 24

1 along support 23. Scale 65A includes spaced-apart lines
2 that are etched or otherwise applied to a surface of
3 support 32 and indicate distance from surface 51 of force
4 measuring apparatus 21. Sensor 65 communicates or
5 otherwise interacts with scale 65A. Under direction of
6 processing unit 35, speakers 61,62 issue audible acuity
7 stimulus designed to ascertain the hearing acuity of a
8 patient, and display 63 issues visual acuity stimulus
9 designed to ascertain the visual acuity of a patient. In
10 response to delivery of the audible acuity stimulus and the
11 visual acuity stimulus, input apparatus 33 receives and
12 accepts patient responses thereto, which responses are sent
13 to and received by processing unit 35 and stored in storage
14 37. The audible acuity stimulus includes tones or other
15 sounds that are issued in various frequencies and decibel
16 levels, and the visual acuity stimulus includes visual
17 displays, cues or charts and preferably the display of a
18 Snellen chart or other similar chart for measuring visual
19 acuity. Display 63 is a liquid crystal display or other
20 desired display form. Display 63 can also be printed
21 matter if desired.

22

23 In operation, a patient stands upon load bearing
24 surface 51 of apparatus 21 as in FIG. 2 and directly

1 beneath abutment 60 and carriage 24 is moved, either by the
2 patient or by another, as necessary so as to present
3 abutment 60 against the top of the patient's head.
4 Carriage 24 is constructed in such a way such that speakers
5 61 and 62 reside at either side of a patient's head
6 positioned therebetween with abutment 60 positioned against
7 the top of the patient's head. While standing on load
8 bearing surface 51 and with abutment 60 positioned against
9 the top of the patient's head as shown, system 20 is
10 actuated and a screening operation is to take place in
11 which the patient's weight, balance forces, height, visual
12 acuity and hearing acuity are measured and recorded and
13 stored. With regard to weight and balance forces, force
14 measuring apparatus 21 measures the patient's weight and
15 the balance forces exerted by the patient against load
16 bearing surface 51, which weight and balance force
17 measurements are sent to and received by processing unit 35
18 and stored in storage 37 as data. With abutment 60
19 positioned against the top of the patient's head and
20 carriage 24 stationary, sensor 65 communicates with
21 processing unit 35 and calculates the distance between
22 abutment 60 and load bearing surface 51 which is the height
23 of the patient, and communicates this height measurement to
24 processing unit 35, which receives it and stores it in

1 storage 37 as data.

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3 In terms of screening the patient for audible acuity,
4 the screening operation also includes audible acuity
5 stimulus issued by speakers 61,62 in what is considered a
6 hearing test event of the screening operation. In response
7 to the issued audible acuity stimulus, the patient
8 interacts with input apparatus 33 and submits responses to
9 the delivery of the audible acuity stimulus, which
10 responses are intended to be those that affirm his
11 detection of any such tones or sounds or word utterances
12 and the like. Processing system 35 governs the issuance of
13 the audible acuity stimulus in accordance with
14 preprogrammed parameters of software architecture 36, which
15 issuance is responsive to responses input by the patient to
16 the audible acuity stimulus. Preferably, input apparatus
17 is a keyboard or keypad 70 with which the patient can
18 employ for entering his responses. Keypad 70 is supported
19 by an extension of carriage 24 at a location beneath
20 display and toward support 23, and it can be supported
21 elsewhere. Input apparatus 33 can also include a
22 microphone 71 into which a patient can issue spoken
23 responses. All patient responses are entered into and
24 received by input apparatus 33 and communicated to and

1 received by processing unit 35, which stores the responses
2 into storage 37 as data. In screening the patient for
3 visual acuity, the screening operation also includes visual
4 acuity stimulus issued by display 63 in what is considered
5 a vision testing event. In response to the issued visual
6 acuity stimulus, the patient interacts with input apparatus
7 33 and submits responses, which responses are intended to
8 be those that affirm his ability to see such letters,
9 visual cues, etc. Patient responses can be input at keypad
10 70 or into microphone 71 by means of verbal responses. All
11 patient responses to the visual acuity stimulus are entered
12 into and received by input apparatus 33 and communicated to
13 and received by processing unit 35, which stores the
14 responses into storage 37 as data.

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16 The screening operation that system 20 provides, which
17 is carried out when a patient is standing on load bearing
18 surface 51 of force measuring apparatus 21 with abutment 60
19 positioned against the top of the patient's head, is thus
20 characterized by the taking and storing of the patient's
21 height weight, balance forces, hearing acuity and visual
22 acuity, with the taking and storing of the patient's
23 hearing and visual acuity being patient responses to
24 delivered hearing and visual acuity stimulus, which

1 responses are stored in connection with the delivered
2 stimulus. All of these data are stored into storage 37 in
3 the form of an electronic document, which can be accessed
4 and reviewed by clinical personnel and this can be done
5 either with keypad 70 or with a computer linked to system
6 20 and the latter is preferred. The screening operation
7 can be carried out manually or automatically with
8 preprogramming of processing unit 35. Actuation of system
9 20 for prosecuting a screening operation can occur in
10 response to a patient standing on force measuring apparatus
11 21 and abutment 60 resting against the top of the patient's
12 head or in response to a command input at keypad 70. The
13 taking of the patient's height, weight, balance forces and
14 hearing and visual acuity can take place in any desired
15 order and even substantially simultaneously if desired.
16

17 Preferably, system 20 is a self-contained stand-alone
18 unit having a relatively sleek and minimal design for
19 taking up a small amount of space. Force measuring
20 apparatus 21 is pivoted to base 22 at pivot joint 80 so
21 that it can pivoted away from base 22 against a support
22 surface as shown in FIGS. 1 and 2 for normal operation and
23 toward and against base 22 for storage of system 20 when
24 not in use. Although it is preferred that force measuring

1 apparatus 21 be configured to measure weight and balance
2 forces, it can be adapted for measuring only one or the
3 other as may be desired. Keypad 70 is capable of accepting
4 the input of specific patient information including
5 patient's age, sex and details surrounding patient medical
6 history and the input of this information can be delivered
7 verbally and collected by microphone 71 if desired. After
8 such patient information is input, it is delivered to
9 processing unit 35 and stored in storage 37 as data.

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With momentary attention directed back to FIG. 4, a pulley system 81 is contained by base 22 and is coupled to carriage 24. Pulley system 81 includes positive and negative portions 81A, 81B that permit carriage 24 to maintain position along support 23 yet be easily moved reciprocally from one location to another. FIGS. 1, 2 and 3 illustrate a locking lever 82 attached to support 23 that associates with force measuring apparatus 21. Lever 82 is capable of being pivoted/moved into a first position releasing force measuring apparatus 21 to permit it to be pivotally moved and a second position locking force measuring apparatus 21 in place both toward and against base 22 when system 20 is not in use and away from base as in FIGS. 1 and 2 when system 20 is in use and any

1 conventional locking mechanism can be associated with lever
2 82 and force measuring apparatus 21 for carrying out this
3 releasing and locking of force measuring apparatus 21.

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5 The present invention is described above with
6 reference to a preferred embodiment. However, those
7 skilled in the art will recognize that changes and
8 modifications may be made in the described embodiments
9 without departing from the nature and scope of the present
10 invention. Various changes and modifications to the
11 embodiment herein chosen for purposes of illustration will
12 readily occur to those skilled in the art. To the extent
13 that such modifications and variations do not depart from
14 the spirit of the invention, they are intended to be
15 included within the scope thereof.

16

17 Having fully described the invention in such clear and
18 concise terms as to enable those skilled in the art to
19 understand and practice the same, the invention claimed is: